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Information Systems Development Managers' Guide

Human Services Agencies

INFORMATION SYSTEMS DEVELOPMENT

MANAGER'S GUIDE

HUMAN SERVICES AGENCIES

Ministry of Community and Social Services,
Management Information Systems Branch
and
The Ontario Association of Children's Aid Societies

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TABLE OF CONTENTS

TOPIC	PAGE
1. INTRODUCTION	1
1.1 Purpose	1
1.2 Guidebook Organization	5
2. UNDERLYING CONCEPTS	6
2.1 Management Presence Throughout	6
2.2 User Involvement	8
2.3 Looking Outside to Other Organizations	9
2.4 Information Analysis	10
2.5 Corporate Base of Data	11
2.6 Systematic Approach	13
3. METHODOLOGY	15
3.1 Initial Considerations	18
3.1.1 Selecting a Methodology	18
3.1.2 Documentation	20
3.1.3 Testing	22
3.2 Managing The Pre-Project Environment	24
3.2.1 Strategic Planning	24
3.2.2 Identification of Projects	25
3.2.3 Priorities	28
3.2.4 Relationships among Projects	29
3.2.5 Constraints	30

TOPIC	PAGE
3.3 Project Management	32
3.3.1 Preparation	34
3.3.2 Needs Analysis	39
3.3.3 Advisability	48
3.3.4 Software Package Selection	51
3.3.5 Technical Procurement	54
3.3.6 Design	58
3.3.7 Development	62
3.3.8 Implementation	64
3.4 Managing The Post-Project Environment	68
3.4.1 Operations Management	68
3.4.2 Review and Evaluation	70
3.4.3 Identifying New Needs	72
4. SUMMARY OF KEY FACTORS FOR THE MANAGER	74
5. APPENDICES	76
5.1 Glossary of Terms	77
5.2 Sources of Information	83
5.3 Sample Tables of Contents for Documentation	91
5.3.1 Initiation Report	92
5.3.2 Information System Requirements	93
5.3.3 Advisability Report	95
5.3.4 System Design Specifications	97
5.3.5 Manuals	104
5.3.6 Post-Implementation Report	109

1. INTRODUCTION

1.1 Purpose

The managers of human service agencies are under increasing pressure from the public, their clients and limited budgets. This pressure requires managers to take advantage of every opportunity to make their operations both efficient and effective. Information management is one of the most useful techniques a manager has to assist him/her in responding appropriately to the demands made on the organization.

A manager must treat information just like any other scarce resource under his/her direction such as money, staff or facilities. The manager uses this information to make decisions to improve the ability of the organization to meet its goals.

This guidebook is designed to assist managers in the planning, development, control, and evaluation of either manual or automated information management systems. Of primary importance is the recognition that effort in developing information management systems should reflect the significance of the functions to the organization. The managers it addresses may be Board Members, Executives or Business Managers involved in providing human services to the community. The guidebook will also be useful to Ministry of Community and Social Services' Program Supervisors and Area Managers because of their monitoring and review roles.

The guidebook will assist managers to:

- analyze and document their information needs
- plan, monitor and control the development process
- avoid many common pitfalls in information systems development
- realize the benefits of successful information systems.

Managers should keep in mind that there are many groups both inside and outside the human services agencies which have legitimate concerns related to the management of information. The groups are identified in Section 3.3.2 and must be considered at all stages of development of information management systems.

This guidebook emphasizes that the process of developing information management systems, whether manual or automated, is a human activity, not an abstract technical exercise. It is a process involving a deep understanding of organizational functions and of people, how they interact in organizations and how agency activities can be changed by a new system.

This guidebook recognizes that, in the human services environment, one primary source of information on the activities of the organization is the front-line worker and therefore he/she must be committed to and clearly understand his/her role in the collection of and uses for timely, high quality data.

The benefits to a manager of an information management system include:

- ability to monitor and control expenditures and programs so decisions on adjustments in clinical workload, budgets and case work issues can be made as early as possible

- capacity to respond in an organized way to changes in the environment (e.g. legislation, new kinds of services, shifts in population).

- ability to analyze the operations of the agency through the use of specific and timely data.

- ability to return to the workers useful, up-to-date information, either on a specific case or on an aggregated basis that will assist them in the performance of their job.

You, as a manager, should be interested in this guidebook because it describes specific steps in a process which will help you to develop better information management systems and to avoid many of the problems associated with that development.

The assumption made in this guidebook is that you are a manager of a social services agency which does not have an internal computer systems group. Therefore the specification, design, development and implementation of a computer system will be likely handled by outside suppliers. The methodology is presented from your point of view as a manager with overall responsibility to review and approve the activities of the project, (i.e. to manage the process of system development rather than the specific activities).

If your agency has already embarked on the development/purchase/installation of an information management system this manual can still be useful to you in reviewing your current procedures and systems and in planning for changes in the future.

1.2 Guidebook Organization

The remainder of this guidebook is organized as follows:

- The second chapter is designed as an overview of the main principles a manager must keep in mind in planning, designing, and implementing an information management system in his/her organization.

- The third, and main chapter, describes the specific steps in the development of an information management system, the activities in each phase and the project responsibilities. This chapter also provides some warnings and advice on the implications of not following a methodology.

- The fourth chapter is a brief summary of the key points presented.

- The appendices include a glossary of terms, further sources of information and sample tables of contents for documentation.

2. UNDERLYING CONCEPTS

The major concepts associated with successful information management systems apply to all steps of the development process.

2.1 Management Presence Throughout

In general terms, the role of management within any human service agency is to achieve cost-effective, clinically-desirable results. This is accomplished by assisting people towards common organizational goals through planning, organization and support of their activities. A manager balances many factors in conducting his/her work; organizational, operational, economic, personal and technical. These factors are equally important in an information systems project.

The involvement of senior and middle management throughout the information systems project is necessary to:

- create the strategic or long term plan(s) for the whole agency based on a knowledge of the purpose of the agency itself.
- set priorities on projects and make decisions on tactical plans.
- demonstrate commitment on the part of the organization to the project.

- create a collaborative climate in which the staff can participate and contribute to the project.

- provide direction and guidance to the project with respect to overall organizational goals.

- resolve the contentious issues which arise at all levels during the information systems project.

Senior managers or executives must be particularly involved in setting the overall objectives for information management in the organization. This will ensure the information system supports the needs of the organization. Failure to be involved has serious repercussions for the rest of the project, both financially and in terms of lost opportunity.

The potential benefits to be gained from an appropriate management presence throughout the information systems project can be summarized as follows:

- management control over the scope and direction of the project which results in efficient use of staff, time and money.

- an information system, whether manual or automated, that will satisfy the information needs of the organization.

- acceptance and effective use of the information system by data providers and information users at all levels.

- a deeper understanding of the information needs and data flow within the organization.

- coordination of activities with other projects within the agency, in other agencies and with the Ministry.

2.2 User Involvement

It is essential to the success of a project that a participative environment be created in which the users are committed to the project. Users include all of those people who must interact with the system in some way either as suppliers of data, operators of the system, or people who work with the information provided by the system including front-line workers, supervisors and managers. The providers of data and the users of the information must be involved in the analysis of information needs because they are most familiar with the details of the operation and can best make the connection between the agency objectives and the purpose of the system. In addition, it is important to convey to the providers of data their vital role to ensure the accuracy of information ultimately produced.

An information management system must provide feedback and motivation to all its users. A system which addresses only management needs is not likely to be successful on its own.

Another reason for user involvement in the development of information systems is the need to promote

the idea of change, planned change, within the agency. This promotion program may take place over many months and is especially important if an automated system is likely to result. Remember, many people feel threatened by change, particularly if computers are involved, and one must allow time for attitudes to shift and for the understanding of the new role of information in the organization to develop.

2.3 Looking Outside To Other Organizations

The use of the experience of other groups can be beneficial in avoiding problems in developing information systems, particularly automated ones. Before deciding to "go it alone" a human service agency should contact: other similiar agencies to find out what their experience has been, the regional municipality for advice and discussion on shared resources, and the Ministry of Community and Social Services for advice on the development of information management systems. The Ministry provides assistance at several levels: the Program Supervisor is familiar with other projects in other agencies and can assist with advice on budgets and planning; the Management Information Systems (M.I.S.) Branch can assist with advice on planning and systems development and on Ministry information needs.

Although a great deal of time and money can be saved if you look around at the experiences of other similar organizations, it should be recognized that, in

spite of a common mandate through legislation, human service agencies do have significant differences. These differences are often related to size, range of services provided, local demographic patterns or historical precedent. Due to these unique characteristics, information management systems cannot always be transferred from one agency to another. Only a comprehensive data analysis would reveal these differences which often occur at a very detailed or fundamental level. One example is a social services agency which purchased a financial information system from another similar agency and then found the chart of accounts was totally different, requiring extensive and expensive modifications to the system.

2.4 Information Analysis

Information analysis requires the information needs of the organization to be determined before a consideration of solutions can begin. This means that until the problem to be solved has been clearly identified the choice of alternative solutions is not meaningful. Too often in the past, people have been misled by articles in the popular press, aggressive salesmen or the desire to "keep up with the Joneses" into the premature purchase of hardware (word processors, computers, etc.) without a clear idea of where and how the equipment would meet the real needs of the organization. It has been shown to be a major error to buy equipment without an analysis of requirements. The purchase of hardware is often tackled first because it is easier, more

concrete and takes less time than the somewhat abstract but essential job of needs analysis. The direct automation of a chaotic manual system will only increase the problems.

Information analysis is based upon the examination of the information needs and data flows within an organization's operating environment. Figure 1 shows the flow of the four main types of data and emphasizes the concept of a shared base of data for all information needs.

2.5 Corporate Base of Data

Human services organizations are relatively new compared to other organizations such as companies engaged in manufacturing or goods distribution. For this reason the patterns of work are still evolving and therefore the information needed to manage a human service agency is also evolving. Consequently there is a greater need to go through the process of defining the "corporate" data base and analyzing the information needs, data flows, processes and functions. In fact, a good case can be made that the creation of a corporate data base which defines all the data and information needed to support the work of an organization should take place as a separate project, independent of and preceding a systems development project. The results of such a project would include:

THE FLOW OF DATA

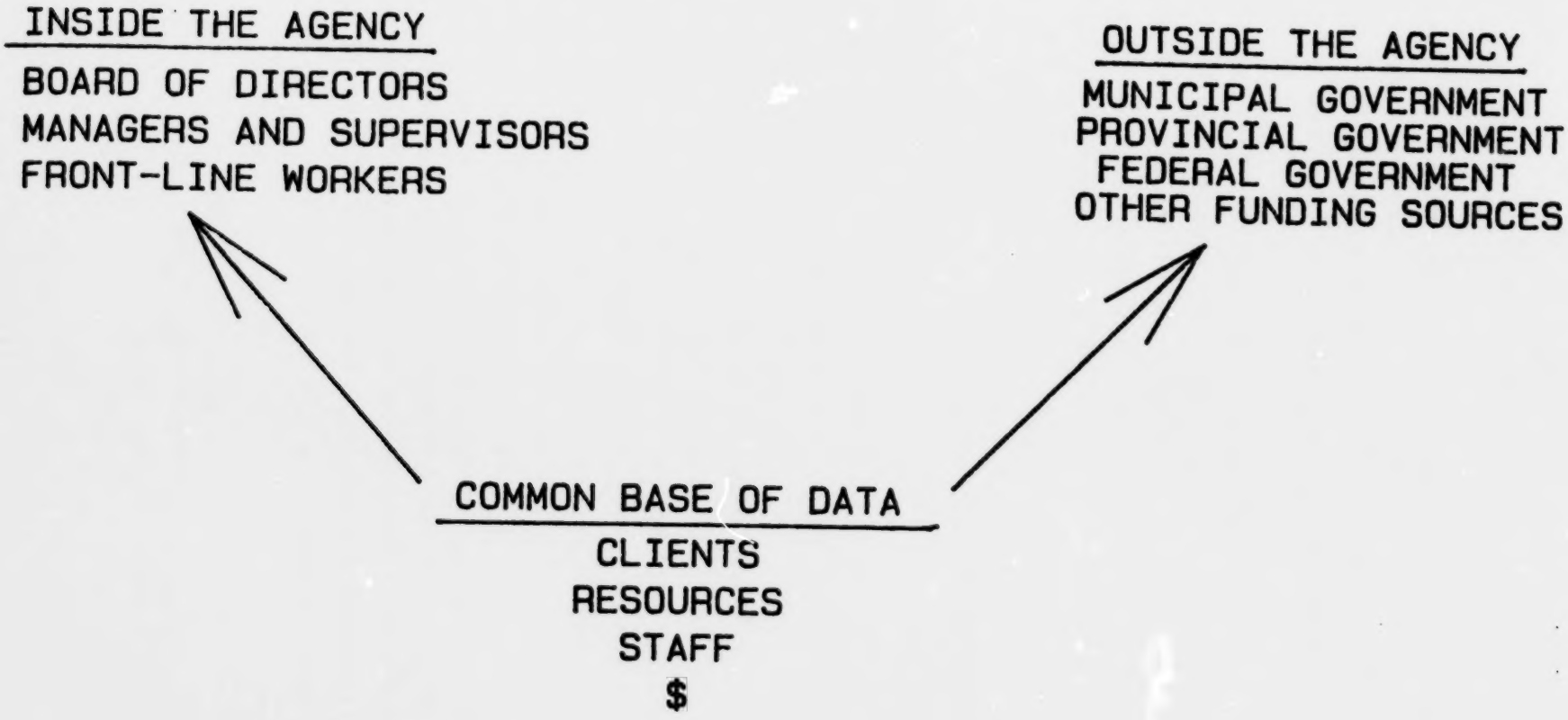

Figure 1

- a common set of defined and documented data elements and definitions to be used and understood throughout the organization. (This result already exists for the Children's Aid Societies in the form of the "Minumum Data Specifications" and "Glossary of Data Definitions" documents.)

- a clearer understanding of the kinds of data used and needed within the organization.

- an understanding of the relationships and data flows among the various parts of the organization.

- a simplified process of needs analysis for any subsequent information systems projects.

2.6 Systematic Approach

To successfully manage an information systems project one must use a systematic approach. A systematic approach to project management has the following benefits:

- provides a framework within which each person knows what is expected of him/her and how he/she is to proceed.

- encourages all participants in the process of defining needs and developing systems to focus on a common problem to be solved.

- permits measurement and control of a project so a manager can recognize when each step is completed.

- minimizes problems of distraction and disorganization.

- helps to ensure the project is successful in achieving its objectives on time and within budget.

- encourages a self disciplined approach to the job at hand.

A methodology is a formal statement of a systematic approach. A methodology is not a panacea - it will not solve policy, procedure or personnel issues, technical problems or sloppy work. It provides a guide within which the exercise of discretion, judgement and plain common sense can be shared with the project team.

3. METHODOLOGY

This section describes the steps involved in an information management system project with emphasis on the manager's role. The methodology applies to manual as well as automated systems but the special conditions that must be considered for computer systems are highlighted. The major steps in this methodology are:

- Initial considerations
- Managing the Pre-Project Environment
- Project Management
- Managing the Post-Project Environment

The relationships between the steps in Project Management are indicated in Figures 2.1 and 2.2. Although presented as a sequence of discrete steps, you should recognize that each step overlaps somewhat and findings in a later step may require some backtracking to previous steps. The methodology is a process of stepwise refinement working from a definition of the problem to be solved to a solution. In most cases the problem and the implications of each solution are too complex to be handled as a whole in detail. Therefore the problem, and the solution, are examined in general and then by component in increasing detail as the higher level information is understood. This approach helps to ensure the overall objective is not lost in a mass of detail.

INFORMATION SYSTEM LIFE CYCLE

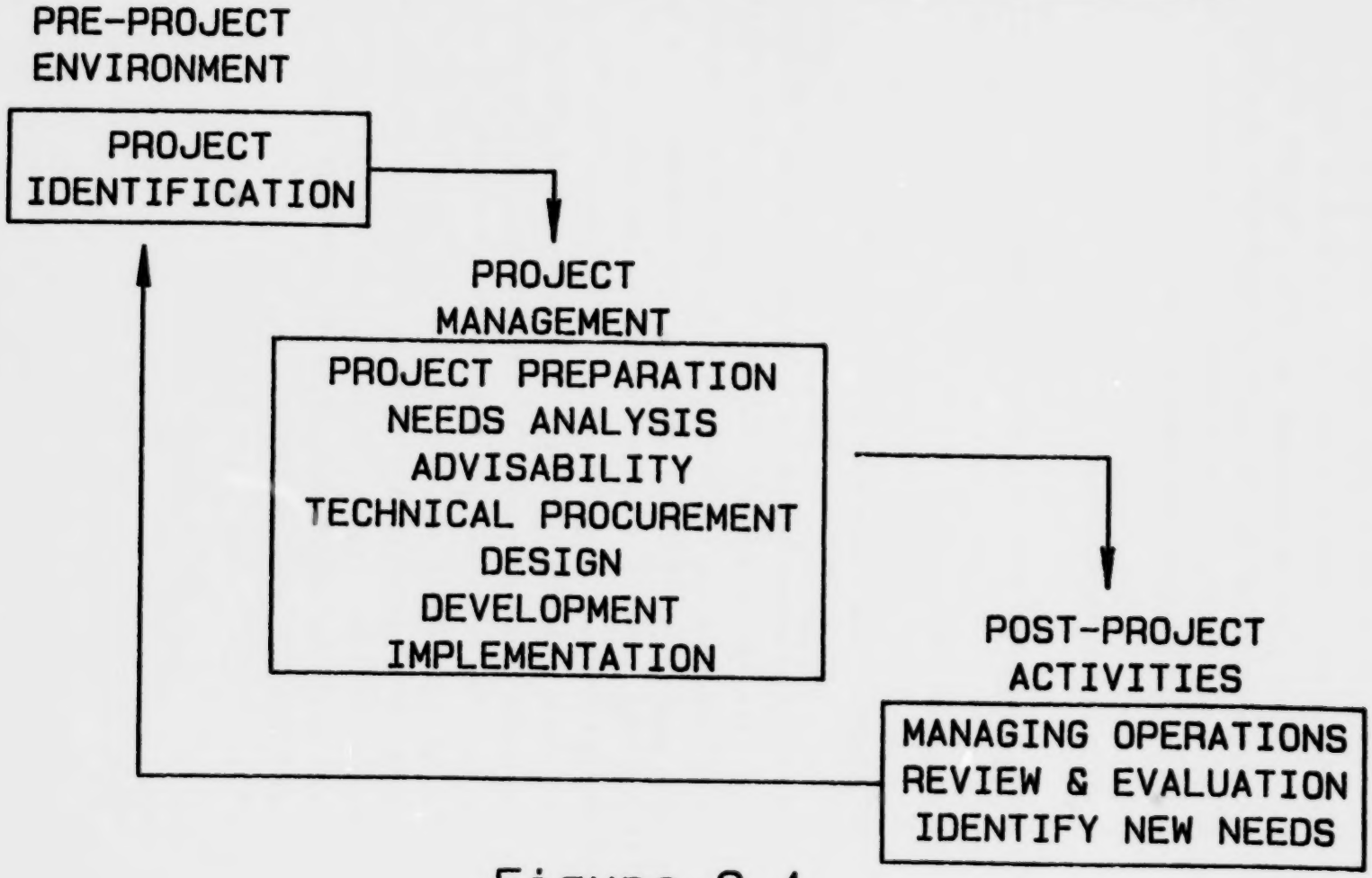

Figure 2.1

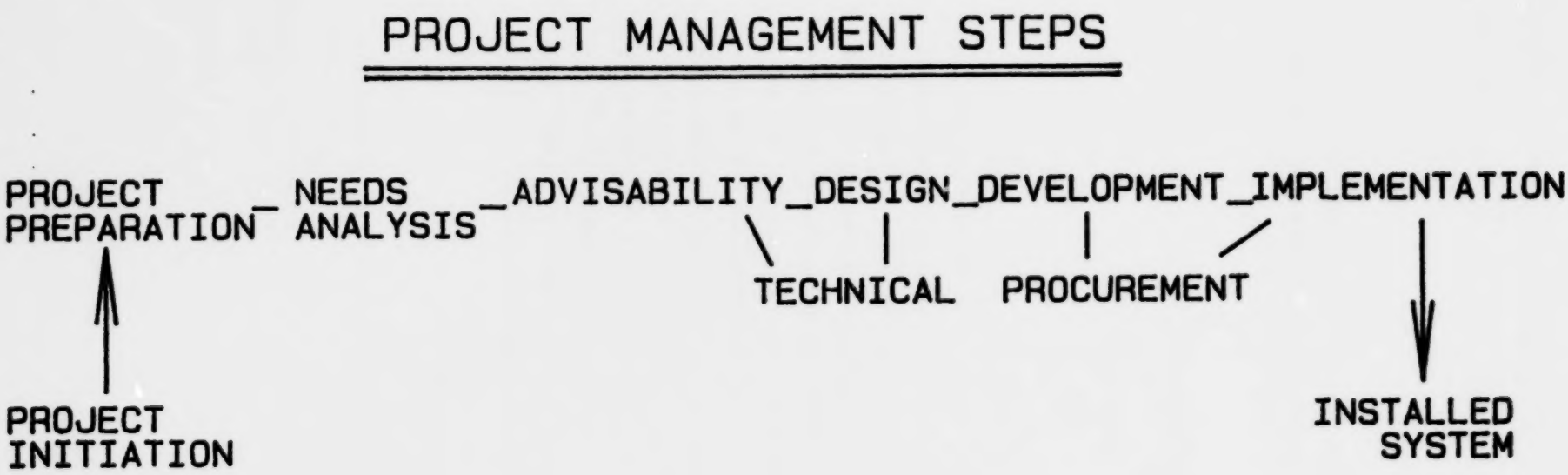
PROJECT MANAGEMENT STEPS
PROJECT PREPARATION
NEEDS ANALYSIS
ADVISABILITY
DESIGN
TECHNICAL
DEVELOPMENT
PROCUREMENT
IMPLEMENTATION
PROJECT INITIATION
INSTALLED SYSTEM
OUTPUTS FROM STEPS
PROJECT PLAN
INFORMATION SYSTEM REQUIREMENTS
ADVISABILITY REPORT
SYSTEM DESIGN SPECIFICATIONS
SYSTEMS & PROCEDURES

Figure 2.2

3.1 Initial Considerations

This section highlights global or project-wide aspects of the methodology. These important aspects include:

- Selecting a Methodology
- Documentation
- Testing

Documentation and testing will also be described in each step of the Project Management section 3.3. For small human service agencies section 3 may seem a bit overwhelming in its complexity and level of detail. Judgement and common sense should be used when applying the methodology, and certainly automation should not be considered the only answer or the best answer to an agency's information management needs. However, the needs analysis, advisability, documentation and testing parts of the methodology apply to both automated and non-automated environments. One must go through these steps in some form in order to manage the project successfully.

3.1.1 Selecting a Methodology

A good methodology provides positive responses to the following key questions:

Does the methodology require the preparation of documented results as the output of each step?

Are these documents adequate background for the activities of the following step?

Is all of the documentation necessary and at the appropriate level of detail for the step and the intended audience?

Does the analysis of the information needs of an organization proceed in a top-down fashion from strategic, through tactical, to operational levels?

In the methodology, does the identification and specification of the problem precede the consideration of alternative solutions?

Are there mechanisms in the methodology for the review and evaluation of projects in terms of organizational priorities set before implementation and in terms of goals achieved afterwards?

Does the analysis of information needs focus on the flow of data and the processes which use data to satisfy information needs?

Are both present and future data flows and processes included in the analysis of information needs?

Does the methodology provide checklists of activities and outputs at each step of the project?

Does the methodology provide mechansims for monitoring progress against a schedule and for determining the completion of a step?

Are management commitment and user involvement integral principles in the use of the methodology?

3.1.2 Documentation

The importance of good documentation to the usefulness of an information management system cannot be over-emphasized. Documentation for a system provides several functions:

- it simplifies the training of new personnel
- it standardizes procedures and controls
- it is an indispensable aid to design and maintenance
- it facilitates changes to the system
- it provides a measure of the degree to which the system meets the original objectives.

The degree to which the documentation provides these functions is governed by the following factors:

- completeness
- currency
- accuracy
- level of detail

Appendix 5.3 provides sample tables of contents for documentation.

Documentation begins in the needs analysis and advisability steps and continues for the life of the system. As a manager, you must insist that documentation is an integral part of the project, not something which is done at the end of the project "if there is time". It must be planned with standards on content, organization and level of detail for each type of documentation in the project. Because there are several groups who have an interest in the system from different points of view the documentation must reflect this. Emerging from the working documents generated during the project the following documentation manuals must be in place:

- Participant's Manual - for those who supply data to the system
- Operations Manual - for those who operate the system
- Technical Manual - for those who provide technical maintenance and system enhancements
- User's Manual - for those who use the information provided by the system.

Each manual must provide a sense of the overall system and clearly identify the part that each group plays in ensuring the long term usefulness of the system.

The participant's manual should describe the steps to be followed in collecting, recording and entering the data into the system and the reasons for the edit and verification procedures - to ensure the consistent quality of data.

3.1.3 Testing

The testing of an information management system is an essential part of the project. It must be planned and coordinated with other project activities so people and facilities are available when needed. A test plan contains a description of all the tests which are considered necessary to be able to verify the system performs according to specifications.

There are several kinds of tests that can be conducted:

- hardware tests - do all of the pieces of equipment communicate properly with each other
  - is the power supply large and stable enough

- program tests - do each of the programs react properly to expected and unexpected input data
  - do the programs inform the user of incorrect data

- system tests - does the system as a whole perform according to specifications in terms of response time, error messages, capacity to handle large volumes of data, and providing correct responses to mixtures of test cases

- procedure tests - do the security, backup and recovery procedures work as specified

  - are the forms or screens for collecting data correct and easy to understand

  - are all terms clearly and consistently defined

  - are the controls in place to verify procedures are being followed

All these tests should be performed by the project team and verified by a user testing team operating independently. This arrangement is particularly useful for system and procedure testing where the users are more likely to be involved. Testing is a cumulative, ongoing activity as each part or step of the process of system development is completed. A record of the results of each of the tests must be kept and the action taken to correct any errors discovered. A distinction must be maintained between errors and changes in specifications.

3.2 Managing the Pre-Project Environment

This section deals with the pre-project activities necessary to maximize the success of an information management project.

3.2.1 Strategic Planning

Managing the project environment begins at the senior management level of the organization with the preparation of a strategic plan. This plan consists of the overall policies and goals for the organization based on an identification of the "business" the organization is in and wants to be in. A goal of the strategic plan may be the providing of information to support the strategic plan. The plan is a necessary precondition for successful management of projects. Within the strategic framework each proposed project can be evaluated and ranked with respect to the degree to which the project's objectives contribute to the strategic plan. Without this plan it is difficult to see how each project fits in or to compare one project with another when allocating scarce resources.

From the strategic plan (what to do/why do it) the tactical plans are developed to implement the strategic plan. The tactical plan address the "how, when, where and who" of the strategic plans and are used by supervisors to implement the plans at the most detailed, or operational level.

The organizational policies should identify:

- responsibilities and authorities for information management systems development
- standards for development of information management systems including methodology, documentation, equipment evaluation procedures, make/buy evaluation procedures
- procedures for review and change of policy
- criteria for judging the advisability of information management projects
- organizational preferences for the kinds and extent of controls required for information management systems (e.g. access, confidentiality)

3.2.2 Identification of Projects

Projects are identified in response to needs within the organization. There are several ways in which new needs are identified, including:

- the manager, in light of long range plans
- observations made by those involved in daily operations
- the review of a previous project
- external organizations (e.g. Ministry of Community and Social Services, Health and Welfare Canada, Auditors)

For each proposed project a brief initiation report should be prepared by you, the manager, which does the following:

- identifies the project, its initiator and its relationship to the strategic plan, including any time constraints
- outlines the perceived problem, requirement or opportunity and indicates its impact on the organization
- outlines the aims of, and the approach to, the proposed solution, including suggested milestones
- suggests project development responsibilities
- requests approval from senior management to proceed to the next phase (definition of needs and advisability)
- identifies sources of funds and budgetary provisions
- outlines the anticipated benefits and costs both tangible and intangible.

When each project initiation report is reviewed by a management committee, the following questions should be asked:

- Are the objectives of the proposed project compatible with the objectives of the organization?

- Is the rationale for the project clearly defined? In particular, is the urgency of the requirement or problem clearly defined?

- Are the consequences of not doing the project clear?

- Is the scope of the project clearly defined so the working boundaries can be recognized?

- Are the skills, time and funds available to complete the project?

- Is the workplan proposed for the next phase of the project reasonable in terms of the resources that will be consumed, the control that will be available and the methodology that will be used?

- Who will be responsible for ensuring the project's success?

Note that a project may be dropped after reviewing the initiation report if it cannot be justified. The screening process is an important aspect of this review. Not all projects should be done!

3.2.3 Priorities

In selecting the initial information systems projects which will be carried further, it is important that priority be given to those which have:

- early payback or benefits to the organization, such as improved client service, increased productivity, reduced costs
- high visibility, to lay the groundwork for future work and to develop commitment to the project
- high probability of success
- acceptable costs.

Only after the organization is committed to the strategic plan through demonstrated success can longer term projects be successfully tackled. These factors are particularly important when first introducing information management systems to the organization.

The probability of success is inversely related to risk, and risk in an information systems project is determined by these factors: project size and complexity, experience with the technology, and project structure. The larger and more complex the project, the greater the risk. The more familiar the project team is with the organization and the organization with the technology involved, the lower the risk.

For a well defined problem with a well structured or known solution, the risk is lower than for a project where the problem to be solved may be subject to change or personal judgement.

3.2.4 Relationships Among Projects

It is rare for only one information management project to be proposed, and therefore it is necessary to develop a plan which includes all proposed systems. This plan should indicate the dependencies between projects in terms of priority, logical sequence, mandatory or necessary vs. supporting, and the implications for data gathering and budgets of the sequence of development. The interfaces between systems should also be outlined at this time as should the groups of data which are shared by systems. One way of handling the interfaces is to have them documented by a joint committee of users and analysts reporting to the agency manager, perhaps through an information management steering committee.

Projects may be at different stages with some systems requiring modifications and others development from scratch. The impact of these activities on one another and on the organization must also be organized and coordinated by the manager.

The manager of information systems is responsible for the preparation and updating of the strategic plan, subject to the project priorities established by the organization.

3.2.5 Constraints

There is a need to show progress in the development of information systems as soon as possible to maintain a high level of interest in the project. This can be done through project newsletters, briefings and pilot demonstrations.

In "selling" the information system concept to the staff, particularly the front line workers, it is important not to "over-sell" the purpose and impact of an information system. Unrealistic expectations can create a strong backlash when not realized and can jeopardize the successful implementation of the system.

The promotion of an information management project involves "selling" the idea not only to staff but to other managers and the board of directors as well.

At times the pressure of deadlines such as those resulting from changes in legislation create information demands which force the rapid development of information management systems. Managers should recognize these situations and realize the costs involved in responding to these needs on a priority basis. These costs may include:

- increased staff workload
- incomplete needs analysis
- development of systems unco-ordinated with other needs
- non-optimal solutions
- redesign costs at a later date
- loss of participative environment

Judging the correct rate of change is the responsibility of the manager with his/her knowledge of the organizational environment and personnel.

3.3 Project Management

You have now identified several projects that you feel are important to your organization. Let's look next at the details of how you go about implementing one of these. In this section of the guidebook we look at sound reasons for organizing each project into the following seven steps:

- Preparation
- Needs Analysis
- Advisability
- Technical Procurement
- Design
- Development
- Implementation

An estimate synthesized from various industry sources of the relative amount of effort (and cost) associated with each step in the project are:

Preparation	5 - 10%
Needs Analysis	10 - 15%
Advisability	10 - 15%
Technical Procurement	5%
Design	15 - 25%
Development	20 - 40%
Implementation	10 - 30%

Specific kinds of documentation or deliverables are produced at each step in the project:

- Preparation - a project team organization with well defined roles, reporting relationships and objectives

- Needs Analysis - a requirements report describing the information needs of the organization

- Advisability - a report which describes, evaluates and selects alternatives for satisfying the information needs of the organization

- Technical Procurement - at the end of this step the necessary hardware and supporting software have been selected and are available to the project team

- Design - a detailed specification of each part of the system and how it will work including forms and procedures
  - a test plan for development and implementation
  - draft documentation for users, providers and operators

- Development - test results for all parts of the system
  - complete documentation of the system

- Implementation - training completed
  - system fully operational
  - all documentation updated
  - new needs identified

3.3.1 Preparation

In preparing for an information management project the administrative environment must be established by the agency manager who defines the reporting relationships, authorities, responsibilities and team structure. In this environment it is important that there be a structure in place such as:

- a single project manager, not a committee, who is responsible for the project

- a short, clear, line of communication between the project manager and the executive (e.g. Agency Director or Business Manager) who requested, authorized and is ultimately responsible for the outcome of the project

- a steering/user/review committee reporting to the agency manager, composed of senior agency staff responsible for monitoring the progress of the project and ensuring adherence to standards, schedules and budgets, and users directly affected by the project and familiar with the operations of the organization. This committee

may act as the user acceptance team or they may select people for that purpose. The main purpose of this committee is to advise the agency manager and the project manager on the administrative and content related activities of the project.

- a project team consisting of both users and analysts in which the users play as strong a role as possible since the system is for them. In some cases the project manager is from the user community. The role of the project team is to carry out the tasks required to design, develop and implement the system.

- a user acceptance team which is responsible for conducting tests of the system to verify that it meets the specifications.

If the organization does not have the people with the required technical skills for the analysis and design, the project team can be augmented by specialists from outside the organization. Regional municipalities, the Ministry of Community and Social Services or private management and computer systems consulting companies are all potential sources for the needed specialized information management skills.

Small committees with specific roles, timetables and objectives can be a effective way of including the various user groups in this process. A manager's (e.g. Agency Director's) role in this case is to establish the committees and provide them with guidelines and the assurance that their findings are important in determining the success of the project. The purpose of these committees is to advise the manager not to authorize the project manager's activities.

The manager's participation at this stage is very critical as decisions made now will affect the entire project. The most important decision is the choice of the project team, especially the project manager. A project manager should be experienced at his/her job and should have demonstrated skills in organizing, supervising and communicating with the project team and to the agency manager and steering-/user/review committee. The project manager should provide the agency manager with a feeling of trust and confidence that the project is under control. He/she will do this by:

- regular progress reporting against a workplan, dealing with the issues of importance to the manager (cash flow, milestones)

- being sensitive to the realities of the organization and contacting those people who need to be contacted

- understanding both business and technical problems

- building the correct team structure to get the work done at each step of the project.

In evaluating a project manager an agency manager should trust his or her own judgement but also inquire of the staff who come into contact with the project team.

The second most important decision is the selection of a methodology appropriate to the scope of the project. This should be chosen in consultation with the project manager who will have to carry out the project. A project to investigate the use of word processors, for example, goes through the same steps in the methodology but in an abbreviated form compared to a project for an agency-wide financial management system.

Two final areas also require the agency manager's (e.g. Agency Director's) involvement during the project preparation step. The manager, in his role as sponsor of the project,

is responsible for introducing the project and the project team to the organization so their role is clearly understood. With respect to user, board and steering committees the manager must provide the interface to co-ordinate the activities of each and assure that participation in the committees is controlled and that it is kept separate from authority which remains with the agency manager.

3.3.2 Needs Analysis

The needs analysis step is necessary to investigate, analyze and document the problem, issue or opportunity previously identified. Therefore the agency manager's major role in this step is to monitor the activities of the project team to ensure that they are addressing the right problem. This step is absolutely critical because if the basic needs are not correctly specified at this time then the remainder of the project will be misdirected.

The two main activities which the project team undertakes in this step are:

- review and documentation of the current system
- definition and organization of needs or requirements.

3.3.2.1 Project Management

At various times throughout this step the agency manager should get from the project manager the following information:

- a workplan and timetable for all the activities in this step with logical milestones for review and approval
- progress reports indicating actual performance against the workplan

- policy or organizational issues which have arisen from the study

- lists of people and organizational units interviewed to document their needs

- a requirements report which documents:
  - the current system, including procedures, interfaces, data flows, processes, data elements and data volumes
    (For an organization with good documentation this may only involve selected portions of the current system)
  - the shortcomings of the current system or new requirements
  - the quantified, ranked benefit of each changed or new requirement, usually organized by function
  - the needs, expressed in terms of new procedures, inputs, outputs, organizational impact, interfaces, data flows, processes, data elements and data volumes
  - the data elements and their relationship to processes, usually through a data dictionary and a data model, respectively.

The project manager's workplan should include the following steps:

- Review the organization's purpose and objectives. The definition of the needs for an information management system must begin with a

statement of the purpose of the system. This purpose should be directly related to the objectives of the service organization and its environment and should support these objectives. An information management system which is developed either independently of the organization's objectives or in an organization with unclear objectives, is unlikely to be successful.

- Determine:
  - who are your clients
  - how are they provided with service
  - what are they provided with.

  There are many groups ("stakeholders") with vested interests in the management of information. These groups include:

  - the client/family
  - the caseworker
  - the agency/program manager
  - the agency director
  - other service providers
  - the local municipalities
  - other associations
  - the Ministry of Community and Social Services
    - the program supervisor
    - the area manager
    - the regional director
    - the Management Information Systems Branch
    - the ministry corporate group
  - other provincial ministries
  - the federal government
  - other funding sources

- Determine or (examine) the matrix of functions the organization performs in order to carry out its purpose and objectives. These functions in a human services environment can include: Case Management, Resource Management, Program Management, General Administration.

- Identify the processes related to functions (Planning, Budgeting, Allocating, Monitoring, Negotiating).

- Through examination of the described processes determine the relationships between and the results of each (Information and Data Flows). These results can include cash flows, manpower requirements, program maintenance, program development and program closure.

- Review each result with a view to identifying the supporting information (Information Requirements). For example, the required information may include allocations, staffing, length of stay, utilization trends, resource rates, community characteristics.

- From the identification of information requirements determine related data elements (Data Model).

  The data model for a human services agency will consist of the major logical entities or groupings of data and the specific data elements related to each logical entity. The major

logical entities could be: Clients, Resources and Community Demographics. The associated data elements would include:

- for Clients - age, sex, admission history, discharge history, treatment schedule.

- for Resources - budgeted and actual expenditures, capacity utilization, available resources.

- for Community Demographics - social indicators, unemployment rates, age/sex/education/income patterns.

In short, information analysis produces the information needs which determine the data model. The data model requires data definitions and leads to a consideration of data gathering issues.

3.3.2.2 Data Model

The usefulness of a data model is based on the premises that:

- a core of data changes rarely

- procedures and processes change frequently

- the model is independent of technology

- users in an organization recognize the importance of data in creating information and the importance of timely, accurate information for managing.

The project team should examine existing systems within the organization, in relation to the data provided by each system because:

- for the most part, the existing system represents need - past or current, and can act as a checkpoint for your data model's integrity

- if it proves irrelevant or redundant, it can be discontinued

- a determination can then be made regarding the elements of data that are not now collected and which therefore represent new reporting requirements and data flows

These methods enable the users to express their understanding of the organization and its data and to present this understanding in a data model. It also enables data processing personnel to translate these data models into computer files or data bases that mirror the organization.

3.3.2.3 The Report

The requirements report:

- provides an understanding of the current system and organization

- identifies the data supporting the organization's activities

- tends to stabilize the identified data

- allows communication of requirements between analysts and users via a data model

To produce this report the project team will need to conduct discussions and interviews with the staff involved in the current system in order to collect specific information on current activities and future needs. This information must be analyzed and synthesized by the project team, working closely with the potential users of the system and with the manager to resolve discrepancies, assign priorities, and ensure a logically consistent set of requirements are produced.

3.3.2.4 Potential Problems

During this phase the manager should watch for the following common problem areas:

- a tendency to jump over the documentation of the current system. This tendency should be resisted because not only does the current system reflect the response of the organization to needs in the past but the review of the current system familiarizes the project team with the operations and people in the organization. A closely monitored workplan and interim reviews of the draft report will help avoid this problem.

- "runaway" interviews. Each interview must be planned and have a clear purpose. The project team should be formally introduced by the agency manager or project sponsor to indicate the commitment of the agency to the project. A plan (questionnaire, check list, agenda) should be used to structure the interview and the results of the interview logged and filed in a project book for future reference. There can be either too many or too few interviews - too many, and valuable staff and project time is wasted; too few, and insufficient information is gathered about the needs and requirements.

- failure to assign priorities to each requirement (i.e. rank them). In this area the judgement of the agency manager in consultation with the project manager can be most helpful.

- insufficient detail on, and quantification of requirements and benefits. The results of this phase will form the objectives of the system against which the final product will be evaluated as well as forming the blueprint for the design of the system. Therefore it is essential the analysis of needs be as complete and specific as possible.

- unclear scope. The scope of the study can change considerably if the boundaries are not clearly specified in terms of the parts of the

organization, the functions or the problem to be investigated. If the scope becomes too great then the study will lose its focus and it will be very difficult to assign priorities to the requirements. If the scope becomes too narrow then the full benefits of a new system may not be realized across the organization and a piecemeal group of systems may be developed.

- failure to consider the data flows among the adjacent systems. These interfaces may be between organizational units (internal or external) or between systems within an organization. Since the interfaces are boundaries across which data flows, changes in external requirements can affect internal system requirements and vice versa. It may not be necessary to document these external systems in detail but it is certainly necessary to document the interface requirements and the impact of changing system requirements on them.

3.3.3 Advisability

Based on the requirements identified in the previous needs analysis step, an examination of solutions and advisability can begin. This step sets the main features of the new system arising from the requirements and involves an iterative refinement of options. Advisability is more than feasibility because it involves the question of whether or not something should be done in addition to the questions of whether something can be done. To ensure the project and the solutions proposed are advisable, the project manager's technical skills and the agency manager's practical knowledge of the organization must complement each other.

As a manager during this step you should be involved in the following activities:

- controlling scope. Make sure the number of major, viable options considered is no more than 3 or 4, otherwise the process of evaluation is too complicated. Make sure the level of detail for each option is sufficient to enable choices to be made between options but not too detailed such that an excessive amount of time and money is spent.

- setting evaluation criteria for the options selected that reflect the priorities and needs of the organization. Table 1 (following) contains a partial list of criteria normally used.

- reviewing the process of option evaluation to make sure the team has done their homework. This

TABLE 1

EVALUATION CRITERIA

- Costs
- Time to implement
- Impact on Organization
  - hiring new staff
  - turnover of existing staff
  - additional training
- Benefits to the Organization
- Ability of the Organization to Accept the Solution Option
- Flexibility of the Solution Option
- Growth Potential of the Solution Option
- Match between Information Requirements and the Solution Option

quality control function should look at whether the options are viable, how the evaluation criteria were used, and whether the team carefully examined the implications of the options in terms of costs (short and long term) and organizational impact.

In an advisability study the current system is reviewed, problems identified, the proposed system is designed on a conceptual basis and alternative system solutions are considered and evaluated. The following activities are carried out by the analyst with the co-operation of the users:

- Consider Alternative Solutions
  - define alternative solutions to satisfy the identified requirements, including manual, automated and "do nothing" options
  - prepare a conceptual or abstract data flow for each alternative
  - develop evaluation criteria with the users
  - collect information on alternatives e.g. costs of development or purchase and operation, implementation time, staffing, anticipated savings
  - evaluate alternatives and recommend one
  - prepare feasibility report and detailed work-plan for the next phase.

Decisions made at this stage can result in the expenditure of a great deal of time and money and can significantly affect the operation of the organization. Consequently the following key points should be kept in mind by the manager:

- make sure the decision to go ahead or stop the project is formal and visible within the organization so senior management are aware of the project

- be careful not to be swept away by technology that may not be appropriate for the organization ("over automation")

- involve the user in the review of the alternatives and ensure his/her commitment to the project as a solution to his/her needs

- make sure the project team doesn't underestimate the costs, complexity or timeframe for the project

The completion of this step is a key exit point in the project life cycle since no purchase or committment to continue has been made yet.

3.3.4 Software Package Selection

One of the alternatives considered will likely be the purchase or lease of an existing software package. As a manager you should be aware of the process of selecting software packages that a project manager and his/her team will go through. If one or more of the alternative solutions involves the use of a computer then an examination of existing software packages is an essential step because someone else may have already invented your "wheel". The more common your application area, the more likely it is that usable software is available.

There are however some risks associated with available software. They are:

- large search time and costs
- difficulty of matching features of a package to your needs
- high program modification costs
- restrictive software construction
- poor documentation
- difficulty of maintenance
- susceptibility of software to hardware changes
- minimal or non-existent supplier support
- inefficient throughput
- limited growth potential
- unknown bugs or errors in the programs

To minimize these risks the following criteria should be used when evaluating packages:

- History of the Product - knowledge of the product's development and evolution

- Construction - structure and flexibility

- Operation - flow, control, and throughput

- Utilization - quality and usefulness of the output, and satisfaction of the users

- Adaptability - satisfactory adjustment to new users

- Degree of Fit - the match between your requirements and the package's functional capabilities

- Ease of Modification - cost of required modification critical to the acceptance and use of the product

- Maintenance - continued operation and adjustment of the product to user requirements.

Since the selection of software packages is an occasional activity for most organizations the use of outside help is suggested if the necessary knowledge cannot be found within the organization (i.e., computer systems consultants).

Test trials, demonstrations and benchmarks of the likely packages can assist greatly in narrowing the choice but the tests must be realistic and reflect the actual activities the system must perform.

3.3.5 Technical Procurement

At this stage in the project the requirements and the general system solution are known sufficiently well to enable technical procurement to be initiated. Technical procurement involves the manager in the selection and acquisition of: hardware services (through purchase, lease or from a service bureau), and supporting software and physical facilities (e.g. air conditioning, power supply, security controls). This step should be planned well in advance of requiring the equipment due to delivery lead times.

Although the details of hardware requirements may change because of new information arising out of the activities of the design, development and implementation steps, they should be only refinements of the basic decisions made during the needs and advisability steps. Technical procurement is therefore a parallel step (see Figure 2) to the mainstream systems development steps and interacts closely with them. For example, hardware must be available during the development and implementation steps as should the supporting software tools (e.g. programming aids, database/data dictionary and operating system software). Also the project team and agency staff will likely need to be trained in the operation and use of the hardware and software in advance of implementation.

Due to the highly specialized nature of technical procurement, it is important for the agency manager to have a technically competent adviser to handle this step. This adviser could be someone other than the project manager and should perform the following functions on the agency's behalf:

- with the project manager, prepare a plan for selecting and scheduling the acquisition of hardware, software, facilities and training

- dealing with vendors through tenders, benchmarks and references to other customers to determine the most cost effective way of acquiring hardware services, whether it be through purchase, lease, or service bureau

- verify the financial stability of the vendors

- ensure the acceptability of contract terms

- arrange demonstrations and presentations by the vendors to the executives and steering committee

- make recommendations on the best solution, including hardware, software, communications, etc. Table 2 contains an example of the criteria used to evaluate micro computers.

- co-ordinate the delivery, preparation of facilities, installation and training with the other project activities.

TABLE 2

HARDWARE SELECTION CRITERIA

Processor:

- **How much user memory is there?**
- **What compatibility features are there?**

Keyboard:

- **What special keys are there?**

Screen:

- **How big is the screen?**
- **What screen features are there?**

Storage:

- What is the capacity of each diskette?
- How many diskette drives can be on-line?
- What type of hard disk is available?

Interfaces:

- What types of interfaces are available?

Printer:

- How fast is the printer?
- How wide is the carriage?
- How good is the print quality?

Vendor's Product Support:

- How reliable is the supplier (long term viability)
- How fast and efficient is the service
- What will be provided during start-up period

Compatibility:

- What's the potential for linkage with
  - other hardware
  - other software packages

Duration and Growth:

- What's the life expectancy
- What's the growth potential
  - storage
  - add ons (bells & whistles)
  - linkages to new equipment lines

Cost Comparisons:

- How does the cost compare with others for all necessary equipment and services?

3.3.6 Design

Working from the documented requirements and the chosen solution approach in the needs analysis step, the project team is now in a position to design the system. Design is a process of iterative refinement from a general concept to detailed descriptions of the system processes.

The purpose of the design step is to produce a specification which describes all of the inputs, processes and outputs of the system as well as the interfaces, manual procedures, and hardware which will be needed. It is during this step that the documentation for the system is initiated - user's manual, participant's manual, operator's manual and systems manual.

For a package solution the specification document will contain a detailed evaluation of the software and all of the modifications necessary to match the package to the requirements including costs and workplan.

During this step the manager ensures that his/her previously identified requirements are included, monitors and approves the expenditures against budget, reviews the design and general project activities, and resolves any policy questions which may arise.

For a manual system, this step will consist of the design of procedures, data flows and forms rather than computer system specifications.

Due to the technical nature of most of the activities in this step the project team will consist of systems analysts or analyst/programmers. Compared to the needs analysis step this means less direct user involvement. It is however important that users and managers be involved in reviewing the specifications.
The design step consists of the following activities by the project team:

- prepare overall diagrams showing flows of data between processes

- prepare initial detailed output requirements including destination and report contents
  (These are data formats at key points in the flows)

- prepare detailed input requirements including sources which identify the kinds of data required

- prepare detailed process descriptions

- develop data file requirements including editing, file contents, update, backup and retention procedures

- refine estimates of input and output volumes and frequencies

- describe overall system operation from user's point of view

- describe interface requirements to other systems, procedures or agencies

- refine hardware and specifications for the computer room facilities

- prepare test plan

During the design step changes can be (and usually are) made in the system with relative ease and at low cost. However, once the construction of the system is underway, the impact of design changes on completion time and cost can be horrendous. This is analogous to changing the floor plan of a house just before plastering. Cost overruns of 100 to 300% are not unknown. For this reasons it is essential the design step be conducted carefully with the ultimate objective of the system clearly in mind at all times. Some of the trade-offs involved in systems design are:

- user friendly vs. cost - in general, the easier a system is to use the more complex, and expensive is the interface. However a user-friendly system is more likely to be accepted in the organization.

- batch vs. interactive - an interactive system is more responsive to user's needs but requires more procedural control for access than a batch system and is usually more expensive

- modular vs. monolithic - a modular design has more interfaces with other modules and therefore more "pieces" to keep track of than a monolithic design but is generally easier to build, modify and to test because the logic flow is clearer.

3.3.7 Development

Following from design the system specifications are used to build (develop) the system. This step is the largest in the life of the project both in terms of team size and cost. It is also the most complex and demanding part of the project for the project manager. He/she must therefore keep you well informed of the progress of the project team.

For these reasons the project manager must prepare a detailed development plan and have it reviewed by the steering/user/review committee and approved by the agency management. This plan should be comprehensive, realistic, well organized and include the activities necessary to:

- prepare detailed procedure descriptions for each computer program
- code, test and document each program and module in the design specification according to a test plan
- test the manual and automated operational procedures
- refine the documentation, including design specifications and manuals

The project team at this stage of the process will largely consist of project leaders and programmer/analysts familiar with the technical environment whose responsibility it is to produce a tested system according to the system specifications.

A user test or user acceptance group, separate from the project team should be established by the manager to perform testing of the programs, system and procedures from the user's rather than the programmer's point of view. They too should prepare a test plan based on their knowledge and expectations of the system's operation within their environment. It is important to keep these two testing groups separate so they can act as a check on each other.

3.3.8 Implementation

In this step the developed system is formally introduced into the operational environment. This step is one of the most critical in the whole process of developing information management systems and requires careful planning on the part of agency executives and the project manager, and the willing involvement of the users, operators and participants. The amount of work in this step is often underestimated, particularly in the area of conversion and data entry or file creation.

The step begins with the refinement of an implementation plan by the project manager which addresses the following issues:

- user/participant/operator training and preparation for both old and new staff
- final acceptance testing for hardware and software
- phased schedule of cutovers to the new system (primary systems first then secondary ones)
- completion criteria (final testing and signoff)
- control of requests for system changes
- documentation update and distribution

The cut-over to the new system may involve the parallel operation of the old and new systems. The extra work this places on staff must be planned to be successful. The shut down of the old system should only be made when the managers and users are convinced that it is no longer needed. The fact that many systems are related to one another complicates the scheduling of cutovers and these logical relationships need to be incorporated into the schedule. For example, a financial reporting system which tracks expenditures against budget requires the accounts payable system and the budget system both to be available. An analysis of these relationships will quickly identify the primary systems.

Both users and systems analysts must be involved in implementation since the first group must be convinced the system does what they want before accepting it and the second group must carry out the final testing and tuning in order to get the system accepted.

User acceptance marks the end of implementation and of the project and is usually signalled when the old system is no longer used. Acceptance testing is the responsibility of the user test group, supported by the systems analysts, and consists of "exercising" the system to determine its behaviour under simulated "live" conditions. This usually involves an exhaustive set of test cases which are traced through the system. These cases should include:

- acceptable ("good") data
- unacceptable ("bad") data

- various processing cycles (daily, weekly, monthly, quarterly, annually)
- backup and recovery
- high volume
- updating/deletion/retention of data
- processing and reporting options

To ensure that all possible cases are covered, tables of inputs and outputs for each program and for the overall system must be prepared and the tests carried out against these tables.

3.3.8.1 Training

Training is a key part of the implementation of a system. If the people using, operating and supplying the system do not have a sense of ownership and do not understand and support it then the system is not likely to be effective. Training should be conducted in small groups preferably with "hands-on" use of the system. The manuals to be used should form the basis of the training materials so the transition to live operation is as natural as possible.

Training for the providers of data to the system should include:

- how to find information in their organization
- how to use the manual
- how to fill out the forms (if applicable)
- how to get data into the system

- how to update/correct/delete the data.
- what to expect from the system

For operations staff, the training should include how to handle the data flow for which they are responsible:

- how to receive the data
- how to check and correct the data
- how to communicate with the suppliers of the data
- how to enter the data
- how to process requests for reports
- how to distribute the reports
- what to do when something goes wrong.

For the users, the training should include:

- how to get reports/information out of the system
- what the source (reliability/quality) of the data is
- suggestions on how the system can be used.
- how to interpret the output of the system (assumptions and terminology)

Your involvement in this step consists of ensuring the smooth introduction of the new system into the operating environment. To do this you must be made aware by the project manager of the progress and problems as soon as possible. In addition you must conduct morale boosting activities to maintain the enthusiasm, interest and "comfort factor" of the staff.

3.4 Managing the Post-Project Environment

The implementation of an information management system is like any other capital investment; it has implications for the organization long after the implementation.

3.4.1 Operations Management

This function deals with the day-to-day activities associated with operating and maintaining the information management system.

Operations personnel must monitor the performance of the system, both hardware and software, and supply the manager responsible for information systems with regular reports. These reports should include:

- terminal usage by person, group and time
- offline and online storage usage and rate of growth by person, group
- machine unavailable time and reasons
- transaction processing time and trends
- costs of supplies, maintenance and staff.

The purpose of these reports is to identify problems or bottlenecks in the flow of information before they become serious.

To produce these reports implies a data collection or logging procedure which should be a part of the system itself and should have been included in the

original design specifications. The logging procedure can be a continuous operation or it can be carried out on a sampling basis.

The operation of the computer system should be under the supervision of an operations or data processing manager who may be the director, a business manager or a supervisor of programs in a smaller agency.

An information management system, particularly if automated, has "hidden" work and costs associated with it that a manager should be aware of. These items include:

- on-going training as a result of staff turnover
- staff to operate and maintain the equipment (e.g. new versions of equipment to install)

They are often hidden since they are somewhat peripheral to the design and development effort and often don't get considered. The questions of who is responsible and who pays for all of these items must also be addressed.

3.4.2 Review and Evaluation

For each project a review should be conducted to evaluate the project and document the lessons learned and problems encountered. The review report will give you a comprehensive and objective understanding of how well the project was conducted:

- what are measurable improvements in the daily performance of your organization?
- where have measurable productivity gains been made by your staff?
- where have costs been reduced?
- what unforeseen problems have occurred?
- what perceptions of the system do your managers, users, and participants have?

This will place you in a position to improve the probability of success on future projects and to make meaningful reports to appropriate individuals and groups, such as the Board of Directors, Ministry of Community and Social Services and other human services agencies.

The review should not be done immediately after implementation but about three to six months later to allow the system to "settle in". In most cases a review is never done, primarily because the people in the organizations are more concerned with the job

at hand than with the review once the system is implemented. However, it can't be overemphasized that valuable and unexpected understanding comes out of these reviews and therefore you should insist that they be carried out. It should be conducted by an independent person with a good knowledge of information systems reporting to the agency executive. The review should involve these areas:

- performance
- user acceptance
- contribution to the organization

The performance review involves the comparison of the projected or specified functions against the actual functions of the system; of the actual performance in terms of response time, transactions per day, etc., against performance requirements; of the estimated costs against the actual costs.

User acceptance is usually determined formally by interviews or attitude surveys of managers, users, participants and operators. This should also cover the adequacy of training and documentation.

The organizational contribution of the system is measured by comparing the intended goals and objectives with those achieved.

One of the results of a review is often the identification of new needs, either through dissatisfaction with the new system or through the demonstrated capability of the system to support the functions of the organization.

3.4.3 Identifying New Needs

New needs are identified from several sources - the post-project review report mentioned in the previous section, regular system reviews, comments from staff involved in daily operations, ideas from the various levels of government, or the manager, as part of a strategic plan.

Reviews should be conducted on a regular basis, not just after the completion of the project. The reason for a regular review of all systems is that information management is an organizational tool and therefore it must change and evolve with the organization. By having them on a regular basis, senior management is kept aware of the current status of all information systems and their ability to serve the organization's goals. For a small organization this review process may be quite informal as the managers are closer to the operation.

Operations or DP managers have a responsibility as well to identify for the agency managers new needs, problems or opportunities which they may recognize while operating and maintaining the system.

A primary source of new needs is the manager him/her self. Having been close to a project (possibly for many months) he/she will almost certainly have found some new information needs. By anticipating upcoming requirements and changes, perhaps based on a strategic plan, the manager can directly identify

new needs. Indirectly, the manager is made aware of new legislation or regulations which will require changes to existing procedures and systems by the provincial government or the federal government.

The information systems development process begins all over again when these new needs are documented in project initiation reports and submitted to senior agency management.

4. SUMMARY OF KEY FACTORS FOR THE MANAGER

DO's

- Do maintain a strong presence throughout the project.
- Do review all project initiation reports.
- Do select a good project manager.
- Do involve the users/participants/operators in the process.
- Do a needs analysis before selecting hardware.
- Do look outside the organization.
- Do use a systematic approach (methodology).
- Do make sure the information management project supports the goals of the organization.
- Do prepare and review a strategic plan for the agency.
- Do a cost/benefit analysis for each project.
- Do review each project on completion.
- Do have a project workplan and cost schedule to monitor the project against.
- Do be cautious when buying software packages.

DON'TS

- Don't assume hardware will solve your problems.
- Don't automate without analyzing the information needs and data flow within the organization.
- Don't let the project team work in isolation from the organization.
- Don't neglect the documentation and training aspects of information systems development.

5. APPENDICES

5.1 Glossary of Terms

Application

The business system or problem to which a resource is applied, e.g. Accounts Receivable, Case Management.

Batch

A batch process is a process in which a group of like transactions are collected and processed together, rather than individually as they occur.

Bit

A binary digit with a value of either 0 or 1. It is the smallest addressable unit of a computer.

BPS

Bits per second; usually associated with the rate at which computers transmit data over a communications link.

Byte

A group of bits (6 or 8 per byte are common) which represent a character or storage location in a computer.

Conceptual Data Flow

A conceptual data flow is a technique for describing the movement and processing of data in a system which is not directly related to an existing physical system. In other words it focuses on the data flow rather than the physical or hardware details of how that flow occurs.

CPS

Characters per second; usually associated with the speed of a slow computer printer.

CPU

Central processing unit; the most important part of the computer which controls the execution of programs.

Data

Data is raw numbers, observations, descriptions which have not been interpreted.

Data Dictionary

A data dictionary is an alphabetical collection of data about the data in a system. It contains definitions of each data element, data flow and the contents of each data file in an organized form. It can be in manual or automated form.

Data Model

A data model is a conceptual (non-physical) description of the data requirements, relationships and flows within an organization or part thereof.

Hardware

The physical, tangible equipment which makes up the computer system including printers, terminals, tape and disk drives, etc.

Information

Information is the result of the interpretation, derivation, refinement or manipulation of data.

Information Analysis

The technique of analyzing the information requirements of an organization in order to understand the data needs and processes.

Information Management

A concept in which information is a resource created within an organization which must be treated like other resources. It must be planned, monitored and reviewed to increase the organization's ability to meet its goals.

Input

The raw data which goes into a process.

Interface

Usually designates the part of a system between the user and the computer. It can also refer to a hardware interface, a physical device allowing the devices it is connected to, to communicate. The common boundary connecting two or more systems, organizations or devices.

Iterative

An iterative process is one that repeats.

LPM

Lines per minute; usually associated with the speed of a high speed computer printer.

Mainframe

A large, fast, multi-user computer costing upwards of $0.75 Million with extensive memory and storage capacity.

Methodology

A set of specific procedures for an organized approach to a problem.

Microcomputer

Usually taken to mean a physically small, single user computer which costs under $10,000 and uses 8-bit microchip technology.

Minicomputer

Usually taken to mean a limited, multi-user computer which costs more than $10,000 and uses 16-bit microchip technology.

Modular

A modular system consists of logical, discrete pieces (modules) which perform specific functions and communicate with one another, but which permit independent changes to the internal processing of a module as long as the communication between modules remains the same. This structure provides great flexibility for change.

Monolithic

A monolithic system consists of only one module and therefore the whole system is affected when changes are made in it. All the functions of the system are together not only logically but physically.

Output

The results of a process which may be raw data for another process or information.

Process

A process is a discrete set of activities which support a function. A process transforms input into output.

Software

The instructions or programs which tell the computer what to do - intangible in comparison with hardware.

System

A system is an organized collection of procedures and resources (people and equipment) designed to perform a specific function or set of functions.

Throughput

The throughput of a system is a measure of the amount of work (number of transactions processed, reports printed, records updated) which a system is doing in a given period of time.

User

In reference to anyone who makes use of the computer system to do their job. In general, they take output from the computer, rather than supplying input to it.

User-Friendly

A general term indicating the system helps rather than hinders the user of the system in doing what they want to do. The implication is that most systems are used by people who do not need (or want) to know (or learn) the details of programming languages, operating system commands and data storage to get their job done. With a true user-friendly system the user would almost be unaware they were using a computer.

5.2 Sources of Information

Background

1. Information Systems Needs for C.A.S. Agencies, by Boston, Gilbert, Henry Associates, Draft Report for O.A.C.A.S., September 18, 1980.

2. Consultation Paper - Information Systems Development for Children's Services in Ontario, Ministry of Community and Social Services, May, 1978.

3. Minimum Data Specifications - Children's Aid Societies and Family and Children's Services Agencies, by J.B. Langstaff & Assoc. Ltd., for Ministry of Community and Social Services and The Ontario Association of Children's Aid Societies, March, 1983.

4. Glossary of Data Definitions for the Minimum Data Specifications - Children's Aid Societies and Family and Children's Services Agencies, by J.B. Langstaff & Associates Ltd., for Ministry of Community and Social Services and The Ontario Association of Children's Aid Societies, March, 1983.

Methodology

1. SPECTRUM, by J. Toellner and Associates.

   The suggested methodology of the Ontario Government.

2. Managing the Systems Development Process, by Charles L. Biggs, Evans G. Birks, William Atkins, Touche Ross & Co., Prentice-Hall, 1980.

   A good overall description of the systems development process.

3. Structured Systems Analysis: Tools and Techniques by Chris Gane and Trish Sarson, Improved Systems Technologies Inc., 1977.

   Very useful description of the role of structured systems analysis in the systems development process.

4. The Mythical Man-Month, by F.P. Brooks, Addison-Wesley, 1975.

   A witty but serious book on estimating and project management.

Security

1. Security, Accuracy and Privacy in Computer Systems, by James Martin, Prentice-Hall, 1973.

   Good overview of the issues and limitations on computer security.

2. Privacy and Computers, A report of a Task Force established jointly by Department of Communications/ Department of Justice, 1972.

   A Canadian reference to the privacy question.

Management Practices

1. Encyclopedia of Professional Management, Edited by Lester R. Bittel, McGraw-Hill, 1978.

   General descriptions of business and management concepts.

2. Management: Tasks, Responsibilities, Practices, by Peter F. Drucker, Harper & Row, 1974.

   The reference for modern management.

Computer Software Development-General

1. Software Psychology, by Ben Shneiderman, Winthrop Publishers, 1980.

   Good description of user oriented design concepts.

2. Encyclopedia of Computer Science, edited by Anthony Ralston and C.L. Meek, Petrocelli/Charter, 1976.

   General reference book on computer science concepts.

Miscellaneous Related Articles

How to get a good mini, by J-P Frankenhuis, Harvard Business Review, May-June, 1982.

New worlds of computer-mediated work, by S. Zuboff, Harvard Business Review, September-October, 1982.

The oldest (and best) way to communicate with employees, by R. D'Aprix, Harvard Business Review, September-October, 1982.

Portfolio approach to information systems, by F.W. McFarlan, Harvard Business Review, September-October, 1981.

Managing information systems by committee, R.L. Nolan, Harvard Business Review, July-August, 1982.

A Corporate Strategy for the Control of Information Processing, by H.C. Lucas, Jr. and J.A. Turner, Sloan Management Review, Spring, 1982.

A Framework for Management Information Systems, by G.A. Garry and M.S.S. Morton, Sloan Management Review, Fall 1971.

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Guidelines for humanizing computerized information systems: A report from Stanley House, by T.D. Sterling, Communications of the ACM, 17, 11, November, 1974.

Shopping for a Terminal: Look for the Staples, by F.W. Miller, Infosystems, 1/82.

When Buying Software, To Thine Own Company Be True, by C.T. Thiel, Infosysems, 2/82.

Managing and Integrating Information: The Essence of Office Automation, Infosystems 6/82.

Manager Involvement Needed in Computer Selection, by R. Raysman, Harvard Business Review, September-October, 1981.

Selecting Software Packages, Auerbach Report, by Raymond P. Wenig, International Management Services Inc., for Auerbach Publishers.

How to Rank Computer Projects, by M.D.J. Buss, Harvard Business Review, January - February, 1983.

The Information Archipelago - Plotting a Course, by F.W. McForlon, J.L. McKenney and P. Pyburn, Harvard Business Review, January - February, 1983.

Trade Magazines and Journals

Datamation

Canadian Data Systems

Infosystems

Computerworld

Computer Data

Canadian Business

Harvard Business Review

Business Quarterly

Journal of Management

Sloan Management Review

Communications of the ACM

Journal of Systems Management

IBM Systems Journal

International Journal of Computer and Information Sciences

IBM Journal of Research and Development

International Journal of Man-Machine Studies

Journal of the American Society for Information Science

5.3 Sample Tables of Contents for Documentation

5.3.1 Initiation Report
5.3.2 Information System Requirements
5.3.3 Advisability Report
5.3.4 System Design Specifications
5.3.5 Manuals
5.3.6 Post-Implementation Report

5.3.1 Initiation Report

1. Project Identification

2. Problem/Requirement of Opportunity

3. Approach

4. Project Responsibilities

5.3.2 Information System Requirements - Contents

This set of documentation is made up of the following components:

1. Executive Summary

2. Revised Cost/Benefits

3. Functional Specifications*

4. System Performance and Security Góals

5. Revised Technical Requirements

6. Revised Resource Plan for Project

7. Detailed Resource Plan for Design Phase

* These are documented on a modular basis according to the number and size of business processes being studied.

Each module will have its own reference number which should be assigned as part of the client's information system network. The table of contents for the Functional Specifications follows.

5.3.2 Information System Requirements - Contents

5.3.2.1 Functional Specifications

1. Introduction

2. Principal Recommendations
   - 2.1 System Design
   - 2.2 Policies
   - 2.3 Other

3. Description of Existing System
   - 3.1 Data Flow Diagrams
   - 3.2 Narrative Description
   - 3.3 Trends

4. Description of Logical System
   - 4.1 Function Charts
     - . Overviews
     - . Detailed Charts
   - 4.2 Logical Data flow Diagrams
   - 4.3 Narrative
     - . Objectives
     - . Descriptions
   - 4.4 Data Glossary

5. Description of Proposed Business Systems
   - 5.1 Physical Data Flow Diagram
   - 5.2 Process Descriptions
   - 5.3 Data Flow Descriptions
   - 5.4 Data Store Descriptions

6. Effect on Existing Systems
   - 6.1 Manual Systems
   - 6.2 EDP Systems

7. Conversion Considerations

5.3.3 Advisability Report

1. Executive Summary

2. Introduction

3. Description of Business Processes
   - 3.1 Overview
   - 3.2 Business Process 1
     - 3.2.1 Function Charts
     - 3.2.2 Logical Data Flow Diagrams
     - 3.2.3 Process Descriptions
   - 3.3 Business Process 2, etc.

4. Evaluation of Existing System
   - 4.1 Overview
   - 4.2 Observations
   - 4.3 Evaluation

5. Solution alternatives
   - 5.1 Evaluation Criteria
   - 5.2 Solution 1
   - 5.3 Solution 2, etc.
   - 5.4 Selection of Preferred Solution

6. Conceptual Design of Proposed System
   - 6.1 System Objectives and Scope
   - 6.2 Overview
   - 6.3 System Components
   - 6.4 Technical Requirements
   - 6.5 Organizational Impact

7. Costs and Benefits
   - 7.1 Summary of Costs and Tangible Benefits
   - 7.2 Costs Estimates
   - 7.3 Benefits
   - 7.4 Scheduling of Costs and Benefits

8. Preliminary Resource Plan for Project

9. Recommendations

10. Detailed Resource Plan for the Analysis Phase

5.3.4 System Design Specification

This is comprised of the following collection of documents:

- Executive Summary
- Revised Cost/Benefit
- EDP System Design Specification*
- Design Specification of User Aids*
- System Test Specification*
- Revised Project Plan
- Detailed Plan for Development and Implementation Phases

* These are specifications documents. Their tables of contents follow.

5.3.4 System Design Specification

5.3.4.1 EDP Systems Design Specifications

1. System Description
2. System Flow
3. Data Element Dictionary
4. Index of Files
5. File Definition
6. Index of System Inputs
7. System Input Definition
8. Index of System Outputs
9. System Output Definition
10. Index of Program Communications Areas
11. Program Communication Area Definition
12. System Interfaces
13. System Controls and Audit Trails
14. Software, Hardware and Communication Environment
15. Contingency Plans

16. Conversion

17. Index of Programs

18. Program Specifications*

19. System Maintenance Considerations

* Each module will have its own reference number which should be assigned as part of the client's information system. The table of contents for the program specifications follows.

5.3.4 System Design Specification

5.3.4.1 EDP Systems Design Specifications

5.3.4.1.1 Program Specifications

1. Title Page
2. Table of Contents
3. Program Schematic
4. Program function
5. Program Structure chart
6. Inputs
7. Outputs
8. Updates
9. Data Base Access & Update
10. Input Parameters
11. Calling Program(s)
12. Program(s) called
13. Program Description
14. Special Considerations
15. Internal Codes

5.3.4 System Design Specification

5.3.4.2 Design Specification of User Aids

- User Manuals
- Operators Manuals
- Training Materials
- Procedure Manuals
- Conversion Procedures

5.3.4 System Design Specification

5.3.4.3 System Test Specifications

1. Test Plan

    1.1 System Narrative
    1.2 Testing Overview
    1.3 Resource Requirements
    1.4 Responsibilities
    1.5 Schedule
    1.6 Test Case Coverage Matrix

2. Test Specifications

    2.1 Purpose
    2.2 Method

3. Performance Evaluation Criteria

5.3.4 System Design Specification

5.3.4.4 Program Module Documentation

1. Detailed Module Specification

2. Source Listings

3. Unit Testing

    3.1 Test Plan
    3.2 Test Data
    3.3 Test Results

5.3.5 Manuals

5.3.5.1 User Manual

1. Introduction
2. Maintenance and Distribution of Manual
3. Procedure for Obtaining System Support
4. Responsibilities for Various Organizational Units
5. System Overview
6. Overview of Tasks
7. Task Indices and Frequencies
8. Task Instructions
9. Input Indices
10. Input Descriptions
11. Output Indices
12. Output Descriptions
13. CRT Screen Index
14. CRT Screens

Appendices

5.3.5 Manuals

5.3.5.2 Procedure Manual

The table of contents varies according to client, and will often vary from unit to unit within the client's organization.

5.3.5 Manuals

5.3.5.2 Training Manuals

1. Introduction

2. Responsibilities Training

3. Examples of Processing Cycles

4. Examples of Coding

5. Examples of Tracing

6. Examples of Features

7. Required Training

APPENDIX A - Original Training Plan

5.3.5 Manuals

5.3.5.3 Computer Operations Manual

1. Introduction

2. System Overview

3. Schedule

4. Job Submission

5. Report Distribution

6. Restart/Recovery Procedures

7. File Retention Schedule and Disposition

5.3.5 Manuals

5.3.5.4 System Test Documentation

1. System Test Specifications

2. System Test Data

3. System Test Results

4. System Test Operational Dcoumentation

5. System Test Review Report

5.3.6 Post-Implementation Report

1. Executive summary
2. Introduction
3. Background
4. Evaluation Criteria
5. Analysis of Accomplishments
6. Problem Areas
7. Evaluation of On-Going Support
8. Conclusions and Recommendations